CLAIMS

1. A method of establishing a communication link between a communication device and a smart card adapted to communicate using a valid smart card communication protocol, wherein the valid smart card communication protocol is one of a plurality of smart card communication protocols, the method comprising the steps of:

transmitting a plurality of initiation messages, wherein each of plurality of initiation messages corresponds to each of the plurality of smart card protocols;

receiving an acknowledgment message in accordance with the valid smart card communication protocol from the smart card; and

establishing the communication link using the valid smart card communication protocol.

2. A method in accordance with claim 1 wherein the step of transmitting comprises the step of transmitting the plurality of initiation messages through a single communication channel.

3. A method in accordance with claim 2 wherein the step of receiving comprises the step of receiving the acknowledgment message through the single communication channel.

4. A method in accordance with claim 1 wherein the step of transmitting comprises the steps of:

transmitting a first initiation message in accordance with a first smart card protocol;

monitoring, for a first predetermined time, the communication channel for a first acknowledgment message in accordance with the first smart card communication protocol;

transmitting a second initiation message in accordance with a second smart card communication protocol;

monitoring, for a second predetermined time, the communication channel for a second acknowledgment message in accordance with the second smart card communication protocol; and

repeating the steps of transmitting the first initiation message, monitoring the channel for the first acknowledgment message, transmitting the second initiation message and monitoring the communication channel for the second acknowledgment message until the acknowledgment message in accordance with the valid smart card communication protocol is received.

5. A method in accordance with claim 1 wherein the step of establishing the communication link comprises the steps of:

establishing a communication link between a master module and the smart card using the smart card communication protocol; and

establishing a second data communication link between the master module and the central computer system.

6. A method in accordance with claim 5 wherein the step of establishing the communication link between the master module and the smart card comprises the steps of:

configuring transceiver hardware in accordance with the valid smart card communication protocol to acquire an incoming signal in accordance with the valid smart card communication protocol; and

demodulating the incoming signal in accordance with valid smart card communication protocol.

7. A method of establishing a communication link between a central computer system and a smart card, the communication link using a valid smart card communication protocol of a plurality of smart card communication protocols, the method comprising the steps of:

polling a communication channel using a plurality of smart card communication protocols;

identifying the valid smart card communication protocol when a valid acknowledgment message is received through the communication channel; and

establishing the communication link between the smart card and the central computer system through the communication channel using the valid smart card communication protocol.

8. A method of establishing a communication link in accordance with claim 7 wherein the step of polling the communication channel comprises:

receiving a poll message from a central computer system, the message identifying the plurality of smart card communication protocols;

instructing a digital signal processor to generate an initiation message in accordance with a smart card communication protocol of the plurality of smart card communication protocols;

configuring transceiver hardware in accordance with the smart card communication protocol;

transmitting the initiation message through the communication channel;

waiting a predetermined wait period associated with the smart card communication protocol unless the valid acknowledgment message is received; and

repeating, for another smart card communication protocol of the plurality of smart card communication protocols, the steps of instructing, configuring the transceiver hardware, transmitting the initiation message, and waiting.

9. A method in accordance with claim 8 further comprising the steps of:

shifting an incoming radio frequency signal to a desired frequency bandwidth to produce a shifted signal;

converting the shifted signal to a digital signal; and

demodulating the digital signal in accordance with the smart card communication protocol.

10. A method in accordance with claim 9 wherein the step of shifting an incoming radio frequency signal comprises the step of shifting the incoming radio frequency signal to a baseband frequency bandwidth.

11 .A method in accordance with claim 9 further wherein the step of shifting the incoming radio frequency signal comprises the step of shifting the incoming radio frequency to a subcarrier frequency bandwidth.

12. A method of establishing a communication link between a communication device and a smart card adapted to communicate using valid smart card communication protocol, wherein the valid smart card communication protocol is one of a plurality of smart card communication protocols, the method comprising the steps of:

sequentially transmitting a plurality of initiation messages, wherein each of plurality of initiation messages corresponds to each of the plurality of smart card protocols;

monitoring a communication channel for an acknowledgment message corresponding to one of the plurality of smart card protocols until an acknowledgment message in accordance with the valid smart card communication protocol is received; and

establishing the communication link using the valid smart card communication protocols.

12 ~~13~~. A smart card communication device for establishing a communication link between a smart card and a computer, the smart card communication device comprising:

a transceiver having a variable structure responsive to a control signal;

a digital signal processor coupled to the transceiver;

a controller coupled to the digital signal processor and the transceiver, the controller adapted to generate the control signal based on a plurality of smart card communication protocols.

13 ~~14~~. A smart card communication device in accordance with claim 12 ~~13~~ wherein the controller is further adapted to instruct the digital signal ~~processor~~ to demodulate an incoming signal received by the transceiver in accordance with the plurality of smart card communication protocols.

14 ~~15~~. A smart card communication device in accordance with claim 13 ~~14~~ wherein the transceiver comprises:

a radio frequency transmitter adapted to generate an electromagnetic field; and

a radio frequency receiver adapted to detect variations in the electromagnetic field.

15 16. A smart card communication device in accordance with claim 14 15 wherein the radio frequency receiver comprises:

a first configuration based on the control signal and adapted to shift a data signal modulated onto an incoming radio frequency signal to a first desired frequency bandwidth; and

a second configuration based on the control signal and adapted to shift the data signal to a second desired frequency bandwidth.

546 A4 17. A smart card communication device in accordance with claim 16, wherein the digital signal processor comprises:

a first demodulator adapted to demodulate the data signal produced by the receiver in accordance with a first smart card communication protocol of the plurality of smart card communication protocols;

a second demodulator adapted to demodulate the data signal in accordance with a second smart card communication protocol of the plurality of smart card communication protocols.

18. A smart card communication device in accordance with claim 17, wherein:

the first desired frequency bandwidth is a baseband frequency bandwidth;

and the second desired frequency bandwidth is a subcarrier frequency bandwidth.

18 19. A smart card communication device in accordance with claim 12 13, wherein the controller is further adapted to receive a plurality of commands from a master module for instructing the controller to poll for one or more smart cards, wherein each smart card corresponds to one of the plurality of smart card communication protocols.

19 20. A smart card communication device for communicating with a smart card using a valid smart card communication protocol of a plurality of smart card communication protocols, the device comprising:

a digital signal processor adapted to generate a plurality of initiation messages wherein each of the initiation messages is in accordance with each of the plurality of smart card communication protocols; and

a transceiver coupled to the digital signal processor and adapted to transmit the plurality of initiation messages in accordance with a modulation type corresponding to an initiation message of the plurality of initiation messages corresponding to a first smart card communication protocol of the plurality of smart card communication protocols.

21. A digital signal processor comprising:

a first demodulator adapted to demodulate a first incoming data signal in accordance with a first smart card communication protocol; and

a second demodulator adapted to demodulate a second incoming data signal in accordance with a second smart card communication protocol.

22. A digital signal processor in accordance with claim 21 further comprising a third demodulator adapted to demodulate a third incoming data signal in accordance with a third smart card communication protocol.

23. A digital signal processor in accordance with claim 22 wherein:

the first demodulator is a split phase demodulator adapted to demodulate the first incoming data signal modulated using amplitude shift keying modulation for contactless smart cards; and

the second modulator is a Costas loop demodulator adapted to demodulate the second incoming data signal modulated using amplitude shift keying modulation for contactless smart cards.

24. A radio frequency circuit adapted for establishing a communication link with a smart card using any one of a plurality of smart card communication protocols, the radio frequency circuit comprising:

a first configuration based on a control signal and adapted to acquire a data signal modulated onto an incoming radio frequency signal in accordance with a first smart card communication protocol of the plurality of smart card communication protocols; and

a second configuration based on the control signal and adapted to acquire a data signal modulated on to the incoming radio frequency signal in accordance with a second smart card communication protocol of the plurality of smart card communication protocols.

25. A radio frequency circuit in accordance with claim 24, wherein the first configuration comprises a mixer adapted to shift the ~~data~~ signal to a baseband frequency band.

26. A radio frequency circuit in accordance with claim 25, wherein the second configuration comprises a filter coupled to an output of the mixer, the filter having a frequency response minimizing signals outside a subcarrier bandwidth.

27. A radio frequency circuit in accordance with claim 26, further comprising:

a analog to digital converter; and

a switch adapted to couple the output of the mixer to the analog to digital converter in a first mode and adapted to couple an output of the filter to the analog to digital converter in a second mode.

28. A radio frequency circuit adapted for use in a smart card communication device, the radio frequency circuit comprising:

a first mixer adapted to shift an incoming radio frequency signal to a baseband frequency to produce a baseband signal;

a second mixer shifting the baseband signal to a subcarrier frequency; and

a switch having a first input port coupled to the first mixer, a second input port coupled to an output of the second mixer, and an output port, the switch adapted to couple the first input port to the output port in a first mode and the second port to the output port in a second mode.

29. A radio frequency circuit in accordance with claim 28 further comprising an analog to digital converter coupled to the output port of the switch.

30. A radio frequency circuit in accordance with claim 6 wherein the switch is adapted to receive a control signal indicating the mode, the first mode corresponding to at least a first smart card communication modulation scheme and the second mode corresponding to at least a second smart card communication scheme.

31. A method of communicating with a non-contact smart card comprising the steps of:

demodulating an incoming radio frequency signal to produce an incoming data signal at a smart card communication device;

transmitting the incoming data signal to a master module through a data channel;

identifying from the incoming data signal a smart card communication protocol;

transmitting an outgoing data signal through the data channel; and

modulating an outgoing radio frequency signal according to the identified smart card communication protocol.

32. A method of communicating with a non-contact smart card comprising the steps of:

establishing a radio frequency communication channel between a smart card communication device and the non-contact smart card;

establishing a data channel between the smart card communication device and a remotely located master module; and

establishing a secure communication channel between the master module and the smart card using a security device within the master module.

33. A method in accordance with claim 32 wherein the step of establishing the radio frequency communication channel comprises the steps of:

demodulating an incoming radio frequency signal transmitted from the smart card to produce an incoming bit data stream; and

modulating an outgoing bit data stream transmitted from the master module to produce an outgoing radio frequency signal.

34. A method in accordance with claim 33 wherein the step of establishing radio frequency communication channel further comprises the steps of:

arranging the incoming bit data stream into a plurality of incoming data packets; and

appending a header to at least one of the plurality of incoming data packets, the header including information indicating a security device type.

35. A method in accordance with claim 34 wherein the step of establishing the secure communication channel comprises the steps of:

removing the header from the at least one packet to produce the incoming data at the master module; and

routing the incoming data to the security device based on the information included in the header, wherein the security device is one of a plurality of security devices within the master module.

36. A method of remotely re-programming a smart card communication device comprising the steps of:

transmitting new code through a data channel from central computer system through a master module coupled to a network;

storing the new code in a memory device; and

loading the new code form the memory device to a processor.

37. A method in accordance with claim 36, wherein the new code facilitates the demodulation of a signals transmitted in accordance with a smart card communication protocol.

38. A method in accordance with claim 36, wherein the memory device is an electrically erasable programable read only memory device.

39. A method n accordance with claim 36, wherein the memory device is a ferro-electric random access memory device.